Int.J.Curr.Microbiol.App.Sci (2016) *5*(3): 206-211

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 5 Number 3(2016) pp. 206-211**
Journal homepage: http://www.ijcmas.com

Original Research Article http://dx.doi.org/10.20546/ijcmas.2016.503.025

Rotaviral Diarrhoea in Children Less than 5 years with Reference to their Vaccination Status in a Tertiary Care Hospital

Santhoshini Vaijinath*, S. Sangeetha, R. Prakash, and S.A. Lakshminarayana

Department of Microbiology, Rajarajeswari Medical College, Bengaluru 560074, India
**Corresponding author*

Keywords

Rotavirus, Diarrhoea, Vaccination.

Article Info

Accepted:
15 February 2016
Available Online:
10, March 2016

A B S T R A C T

Rotavirus is a leading cause of infantile diarrhea worldwide & is responsible for approximately 20% of diarrhea associated deaths in children under 5 years of age. Around 20-50% of hospitalized cases of diarrhea are due to *Rotavirus*. Study was conducted from June 2014 to November 2014. A total of 191 stool samples were collected from infants & children less than 5 year of age with history of diarrhea. *Rotavirus* vaccination status was noted. Rota viral antigen in stool sample was detected using a *Rotavirus* stool antigen detection kit (SD – Bioline). Out of 191 stool samples tested, 78 (40.8%) was positive for *Rotavirus* antigen. In this study 134 (70.2%) belonged to less than 2 years of age and 57 (29.8%) were between 2-5 years of age. Among 191 children, 100 were immunized against *Rotavirus*. Among the 91 unimmunized, 78 (85.7%) were found positive for *Rotavirus* antigen. The increase in occurrence of *Rotavirus* diarrhea in unimmunized as compared to immunized children shows the need for *Rotavirus* vaccination. Thus *Rotavirus* vaccination will contribute to significant reduction of *Rotavirus* diarrhoea in children less than 5 years of age.Widespread use of *Rotavirus* vaccines can prevent about 2 million deaths over the next decade.

Introduction

Diarrheal diseases are major causes of hospitalizations and child deaths globally. They account for approximately one in six deaths among children younger than five years

(Black RE et al).WHO and UNICEF data shows 2 billion cases of diarrheal diseases worldwide every year (Bass CW et al). 1.9 million children less than 5 years perish every year from diarrhea. 18 % of all deaths in children less than 5 years is due to diarrhea.

More than 5000 children die every day & constitutes 78 % of the burden in Africa and South East Asia (Bassani DG *et al.*, Parashar UD et al).

In India, annually about 2.3 million deaths occur in children in children less than 5years. Diarrheal diseases are the cause for 3,34,000 of them (Black RE *et al.*, Parashar UD et al). *Rotavirus* is the leading cause of severe diarrhea in children in developed as well as developing countries (CDC 2008). *Rotavirus* infects almost all children

by the age of five, both in the developing and developed countries (WHO 2005 guidelines). It has been estimated that per day, 370000 episodes of *rotavirus* diarrhea occur, 50,000 cases are hospitalized and 2000 die in the world (Zheng BJ et al). In India, about 20-30 per cent of hospitalized diarrhea cases are caused by *Rotavirus* gastroenteritis in infants and young children during winter months (Nath G et al).

Rotavirus belongs to family Reoviridae, genome of the virus consists of 11 segments of double stranded linear molecule of RNA. There are seven *rotavirus* groups (A to G). Only groups A, B, and C infect humans. Group A, which has multiple strains, causes the majority of childhood infections (Zheng BJ *et al.,* Phukan AC et al). Although human of all ages are susceptible to *rotavirus* infection, children 3 to 24 months of age account for the vast majority of severe infections (Ram S et al). The illness usually lasts 3-8 days, but virus shedding continues for about 10 days to 1month (Barnes GL et al).

Clinically, *Rotavirus* gastroenteritis is characterized by profuse diarrhea, mild fever and vomiting, leading from mild to severe dehydration (Bon F et al). The clinical manifestations of *Rotavirus* diarrhea alone are not sufficiently distinctive to permit diagnosis. It is observed that children below 5 years of age who were hospitalized for severe diarrhea showed positivity for *Rotavirus*. Realizing that *Rotavirus* causes severe diarrhea, it is desirable to devise rapid, easy and cost effective methods it's for detection (Versalovic J et al).

Rotavirus can be detected by single step rapid test, Enzyme linked immunosorbent assay, Lattice agglutation test, Ribonucleic acid - Polyacrylamide gel electrophoresis & Polymerase chain reaction (PCR) (WHO guidelines 1997). Early detection of *Rotaviral* diarrheal diseases will reduce indigenous use of antibiotics, development of resistance. Also, to initiate *Rotavirus* vaccination which prevents hospitalization and the fatality of disease (Kelkar SD et al).

Currently two *rotavirus* vaccines have been shown to be effective against *rotavirus* and have been licensed in more than 100 countries, including India (Bahl R et al). In the present study children less than 5 years of age were evaluated for *rotavirus* diarrheal diseases using Standard diagnostic Bioline *Rotavirus* stool antigen kit. This study was taken up to find out the occurrence of *Rota* viral diarrhea at our institute.

Materials and Methods

This prospective study was conducted between June 2014 to November 2014 at Rajarajeswari medical college & hospital, Bengaluru. Permission for conducting this study was obtained from the Institutional Ethical Committee. A single stool sample was collected from 191 infants and children less than 5 years hospitalized in pediatrics ward for diarrheal diseases were included in present study. Vaccination history against *Rotavirus* was duly noted. All diarrheal cases above 5 years were excluded.Stool samples were collected using sterile plastic containers & were transported as early as possible to the laboratory for analysis and the in case of delay samples were refrigerated at 4^0C.

Methodology: A Rapid test one-step lateral flow immunochromatographic assay that detects group A *Rotavirus* was detected using Standard Diagnostic Bioline *Rotavirus* stool antigen kit. This kit used colloidal gold-labeled monoclonal antibodies against the capsid protein of gene 6 (VP6) of *rotavirus*es. Test procedure was done as per manufacture's instruction.

Results and Discussion

Among 191 stool samples collected 134 stool samples were from children less than 2 years of age group & 57 stool samples were from children between 2-5 years as shown in Table 1.

134 patients belonged to less than 2 years of age, of which 83 (43.4%) were predominantly male. The remaining 57 (29.9%) years were in the 2 to 5 of age group.

Table 2 shows 64 (82%) cases were *Rotavirus* positive in patients less than 2 years of age as compared to 14 (18%) in patients of 2-5 years of age. This indicates the higher number of cases occurring in patients below 2 years of age.

Table 3 show that of the 67 unimmunized patients 64 (70.3%) had developed *Rotavirus* diarrhea. Whereas the 67 immunized patients were Rotavirus positive.

Worldwide *Rotaviral* gastroenteritis is responsible for 611,000 childhood deaths out of which more than 80% occur in low-income countries (Bahl R et al). *Rotavirus* is the most important cause of early childhood nonbacterial gastroenteritis in both developed and developing countries.The infection is also observed in older children and adults. In developed countries 50% of pediatric hospitalization are due to acute diarrhea, while in developing countries like India, it is responsible for an estimated one million deaths annually (Paramita SG). Of the approximately 600,000 annual deaths due to *rotavirus* worldwide, more than 150,000 occur in India (Bass CW *et al.*, Bassani DG et al). Also, 20 to 30 percent hospitalized cases of diarrhea are due to *rotavirus*es (Parashar UD *et al.*, Bassani DG et al). It is estimated that *Rotavirus* is responsible for 24 million outpatient visits, 2.4 million hospital visits and 6,11,000 deaths annually with 80 per cent of these taking place in poorer countries (zafer K et al). In India, 350,000 children, under 5 die every year due to acute diarrheal diseases, out of which one third of them is due to *Rotavirus* gastroenteritis. The prevalence of *Rotavirus* diarrhea in India has been found to vary between 7 to 71 % in hospitalized children less than 5 years of age with acute gastroenteritis (Ayman J et al).

In our study *rotavirus* diarrhea was seen in children less than 5 years is (78) 40.8% which is in close correlation with study by Jain V et al & Gazal S et al study, who showed 41% & 41.9%(Jane S *et al.*, Bettina E et al). In earlier studies, prevalence rate of *rotavirus* diarrhea in children was ranging from 33.3% in 1995 to 19.0% in 1998 (Bahl R et al). Few other short and long term studies from other parts of India has revealed varying rates of prevalence that ranged from as low as 4 to 62.6% (Kelkar SD *et al.*, Bahl R *et al.*, Paramita SG, zafer K *et al.*, Jane S *et al.*, Bettina E *et al*.). These wide ranges obviously reflect differences in age group studied, detection methods employed, geographical location, time of onset and duration of the investigation (Kelkar SD *et al.*, Jane S et al).

In our study, table 1 shows 128 (67%) stool samples were from male patients among them 62 (48.6%) were positive for *Rotavirus*. Out of 63 (33%) female patients stool samples 16 (25.3%) were positive for *Rotavirus*. Male patient's incidence is up to 22% higher than that of female patients, which correlates with Shetty Ak et al who showed 23 (65.71%) males & 12 (34.2%) female patients. This is due to a greater susceptibility of exposure to *Rotavirus* diarrheal disease in male children and higher likelihood of them being brought for medical care (Patwari AK *et al.*,).

Table.1 Demographic Distribution of Diarrheal Cases

Age group	Male (%)	Female (%)	Total(%)
Less than 2 years	83(43.4%)	51(26.7%)	134 (70.1%)
Between 2-5 years	45(23.5%)	12 (6.2%)	57 (29.9%)
Total	128(67.1%)	63(32.9%)	191 (100%)

Table.2 Rotavirus Positive Cases in Children

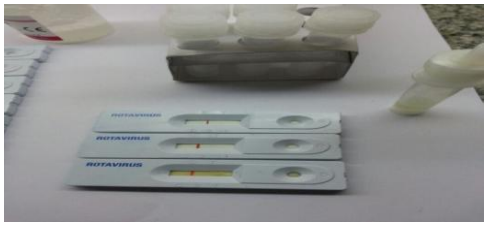
Diarrheal cases	Total number	Number of positive
Less than 2 years	134(70.1%)	64 (82%)
Between 2-5 years	57 (29.9%)	14 (18%)

Table.3 Total Number of Immunized and Unimmunized Children

Age group	Immunized		unimmunized	
	Total	Rv positive	Total	Rv positive
Less than 2 years	67	0 (0%)	67	64 (70.3%)
More than 2 years	33	0 (0%)	24	14 (15.4%)
Total	100	0 (0%)	91	78 (85.7%)

Figure.1 Shows Sd Rapid Test Card and Diluents, Positive Test is Seen

Figure.2 Shows Negative Card Test with Red Band in Control Line



Seasonal Variations

Rotavirus diarrhea was seen all through the year, an increase was noted during the rainy and winter season i.e. in the months of June to November. This has correlated with the other studies Nath *et al.*, , Phukan *et al.*, &

Bahl R *et al.,* where the peak of *rotavirus* diarrhea in winter,as humid conditions facilitate *rotavirus* survival & replication on surfaces (zafer K *et al.*,., Chatterjee B *et al.*,).

Among 191 stool sample as shown in table 2, 134 (70.1%) of *Rotavirus* cases were seen in children less than 2 years of age group which is in close comparison with Patwari Ak *et al.,* who have shown 25 (71.43%).It appeared that infants below 6 months of age were initially protected to some extent by maternal antibodies against severe diarrhea due to *Rotavirus* (Brown DW *et al.,* Broor S et al).
Our study showed 78 (85.7%) positivity for *Rotavirus* in 91 unimmunized patients in table 3. Thus showing *Rotavirus* vaccination reduces the *Rota viral* diarrhea in of children less than 5 years. It would help reduce the global burden of acute diarrheal diseases. Widespread use of *Rotavirus* vaccines can prevent about 2 million deaths over next decade (Selim A *et al.,* Jain V et al).

Immunochromatography is a rapid simple diagnostic tool which can be as a bed side test, does not require skilled person.

Limitation of our study: cannot be used to differentiate between serotypes of *Rotavirus* less sensititive than PCR.

In conclusion, this study highlights that *Rotavirus* diarrhea accounts for a large proportion of diarrheal disease in hospitalized children less than 5 years in Bengaluru and it is seen more during winter months of the year.

To routinely immunize against *Rotavirus* thereby reduce the morbidity & mortality due to *Rotavirus* in children. Thus it prevents hospitalization and fatality associated with *Rotavirus* gastroenteritis.

Acknowledgement

I thank Department of paediatrics for their support for doing this project.

References

Ayman Johargy, Hani Ghazi, Aiman Mumenah. 2010. *J. Pak. Med. Assoc.*, Vol. 60, No. 6.

Bahl, R., *et al.*, Ray, P., Subodh, S., Shambharkar, P., Saxena, *et al.* 2005. Incidence of severe rotavirus diarrhea in New Delhi, India, and G and P types of the infecting rotavirus strains. *J. Infect. Dis.*, 1(192): 114–119.

Barnes, G.L., Uren, E., Stevens, K.B., Bishop, R.F. 1998. Etiology of acute gastroenteritis in hospitalized children in Melbourne, Australia, from April 1980 to March 1993. *J. Clin. Microbiol.*, 36: 133–138.

Bass, C.W., Dorsey, K.N. 2004. Rotavirus and other agents of viral gastroenteritis. In Nelson Textbook of Pediatrics. Edited by STS Reference No. 2014–03172 Page 25 Richard E and Behrman F. Raven Press, Philadelphia. 107– 110.

Bassani, D.G., Kumar, R., Awasthi, S., Morris, S.K., Paul, V.K., *et al. 2010.* Million Death Study Collaborators. Causes of neonatal and child mortality in India: a nationally representative mortality survey. *Lancet*, 376: 1853–60.

Bettina, Essers, *et al.* 2000. *Clin. Infec. Dis.*, 30: 192–6.

Black, R.E., Cousins, S., Johnson, H.L., Johnson, H.L., Lawn, J.E., Rudan, I., *et al.* 2010. Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet*, 375: 1969–87.

Bon, F., Fascia, P., Dauvergne, M., Tenenbaum, D., Planson, H., Petion, A.M., *et al.* 1999. Prevalence of group A rotavirus, human calicivirus, astrovirus, and adenovirus type 40 and

41 infections among children with acute gastroenteritis in Dijon, France. *J. Clin. Microbiol.*, 37: 3055–3058.

Broor, S., Singh, V., Venkateshwarlu, Gautam, S., *et al.* 1985. *J. Diarrhoeal Dis. Res.*, 3: 158–61.

Brown, D.W., Mathan, M.M., Mathew, M., Martin, R., *et al.* 1988. *J. Clin. Microbiol.*, 26: 2410–4.

Centers for Disease Control and Prevention (CDC). 2008. Rotavirus surveillance-worldwide, 2001– 2008. *MMWR Morb. Mortal. Wkly. Rep.*, 57: 1255–7.

Chatterjee, B., Husain, M., Kavita, Seth, P., *et al.* 1996. *J. Trop. Pediatr.*, 42: 207–10.

Editorial: New vaccines: A global vaccine for a global disease -an end to rotavirus diarrhea. 1997. CVI Forum No. 14, WHO, Geneva, p. 2–6.

Jain, V., Parashar, U.D., Glass, R.I., Bhan, M.K. 2001. *Ind. J. Pediatr.*, 68: 855–62.

Jane, S., Nakawesi, *et al.* 2010. *BMC Pediatrics*, 10: 69.

Kelkar, S.D. 1994. Present status of rotavirus vaccine. *Ind. Pediatr.*, 31: 957–69.

Nath, G., Singh, S.P., Sanyal, S.C. 1992. Childhood diarrhoea due to rotavirus in a community. *Ind. J. Med. Res.*, 95(4): 259–62.

Parashar, U.D., Burton, A., Lanata, C., Boschi-Pinto, C., Shibuya, K., Steele. D., *et al.* 2009. Global mortality associated with rotavirus disease among children in 2004. *J. Infect. Dis.*, 200: S9–15.

Patwari, A.K., Srinivasan, A., Diwan, N., Aneja, S., *et al.* 1994. *J. Trop. Pediatr.*, 40: 214–8.

Phukan, A.C., Patgiri, D.K., Mahanta, J. 2003. Rotavirus associated acute diarrhoea in hospitalized children in Dibrugarh, north-east India. *Ind. J. Pathol. Microbiol.*, 46: 274–8.

Ram, S., Khurana, S., Khurana, S.B., Sharma, S., Vadehra, D.V., Broor, S. 1990. Bioecological factors and rotavirus diarrhoea. *Ind. J. Med. Res.*, 91: 167–170.

Selim, Ahmed, *et al.* 2009. *Iranian J. Paediatr.*, 19(2): 107–116.

Versalovic, J., Carroll, K.C. 2011. *Manual Clin. Microbiol.*, 10th ed. Washington, D.C: American Society of Microbiology Publishing. pp. 1456–1469.

World Health Organization. 2005. The Treatment of Diarrhea: A Manual for Physicians and Other Senior Health Workers, 4th ed. Geneva: World Health Organization.

Zafer Kurugol, Seda Geylani, Yeþer Karaca, Feyza Umay, Selda Erensoy, Fadyl Vardar, *et al.* 2003. *Turkish J. Pediatr.*, 45: 290–294.

Zheng, B.J., Ma, G.Z., Tam, J.S.L., Lo, S.K.F., Hon, M., Lam, B.C.C., Yeung, C.Y. 1991. The effects of maternal antibodies on neonatal rotavirus infection. *Pediatr. Infect. Dis. J.*, 10: 865–868.

How to cite this article:

Santhoshini Vaijinath, Sangeetha, S., Prakash, R. and Lakshminarayana, S.A. 2016. Rotaviral Diarrhoea in Children Less than 5 years with Reference to their Vaccination Status in a Tertiary Care Hospital. *Int.J.Curr.Microbiol.App.Sci.* 5(3): 206-211.
doi: http://dx.doi.org/10.20546/ijcmas.2016.503.025